Experimental conditions

- Arrangement of equipments
  - Parametric speakers and dynamic loudspeakers (Pioneer, S-11)
  - Parametric speakers were faced the wall, and dynamic loudspeakers were put on the shelves.

- Test signals
  - White noise of 0.5-s duration
  - Sound pressure levels of test signal at subject location: 58.0 ± 0.3 dB(A)
  - Sound level difference among the speakers: -∞, -9, -6, -3, 0, 3, 6, 9, ∞ dB

- Subjects
  - Eight males and one female
  - Subjects answered perceived positions of the sound images in the nine blocks.
  - Head was not fixed.

- Experimental environment
  - Lecture room (14.00 × 7.93 × 2.70 m)
  - Background noise level was 36.5 dB(A).

Results

- Sound localization using 4 loudspeakers
  - Horizontal and vertical conditions

Conclusions

- Sound image control using four parametric speakers
  - There is no significant difference between the parametric speaker and the dynamic loudspeaker.
  - Horizontal localization is roughly possible, and vertical localization is difficult.

- Future work includes improving directions of the parametric speakers.